Soybean: N2Africa's best-fit practices showcase increased productivity of a high potential but unexploited legume

N2Africa - Putting nitrogen fixation to work for smallholder farmers in Africa

Key facts about soybean

- ❑ Soybean is known as the 'golden bean' and 'miracle crop' because of its multiple uses.
- ❑ Soybean is efficient in atmospheric N-fixation, enhances soil nitrogen status, useful for livestock feed and input for food industry.
- ❑ Soybean is potential source of protein (40%), unsaturated fat (20%) and carbohydrate (29%). Its protein is rich in lysine, valuable amino acid which most of the cereals are lacking.

Why N2Africa focus on the soybean?

- Inoculating soybean seed with the correct rhizobium increases biological nitrogen fixation and gives a good yield for very little cost.
- Enhanced productivity of soybean thereby contributes to improvements in soil fertility, productivity, household nutrition, livestock feed and income
- Untapped soybean production areas in western, north-western and south-western Ethiopia

N2Africa approaches to deliver & disseminate the best fit practices

- N2Africa provided hands-on training for smallholder farmers and encouraged them to try out improved legume varieties and technologies, including i.e. phosphorus fertilizers and rhizobium inoculants.
- N2Africa received feedbacks from farmers ensuring wider promotion of preferred best-fit practices.
- N2Africa mapped, established and functionalized the Public Private-Partnerships (PPPs), promoted effective legume value chain platforms.
- N2Africa linked scientific knowledge with capacity building, women empowerment, and access to input supply and output markets through the PPPs.

Main Achievements

Productivity

- N2Africa's on-farm trials demonstrated that soybean grain yields can be as high as 3300 – 4000 kg ha^{-1} with the application of rhizobia inoculation (I), phosphorus fertilizer (P), good practices and the right varieties.

- Despite significant variability in yield across farms, the soybean grain yield increases due to P &/or I varied from 8-70% as compared to the control (-P-I) in different agro-ecologies of Ethiopia.

- Farmers' preferred of high yielding and marketable varieties were identified and recommended.

Soybean variety name	PPP Clusters	Recommended Areas (Woredas/ Districts)
Dhidhessa, Keta, Ethio-Yugoslavia	Chewaka	Western Ethiopia (Bako Tibe, Dano, Illu Gelan, Gobu Sayo, Wayu Tuka, Illu Harar)
Clark-63K	Jimma	South-western Ethiopia (Kersa, Tiro Afeta)
Belesa-95, TGX-13-3-2644	Pawe	North-western Ethiopia (Alefa, Dibatie, Pawe, Jawi, Mandura)

Preferences

- Farmers evaluated the demonstrated N2Africa packages in disaggregated male, female and mixed groups gave the highest rank for the plots received P+I, and most of them put inoculant (I) as their choice next to the combined P+I application.

- The majority of farmers with positive yield responses due to P+I in average obtained 12.5%, 18.5% & 29.2% gains over the single use of I, P and the control, respectively.

Other benefit observed

- Residual effects of nodulated roots and defoliated leaves at the time of maturity improved the soil nitrogen and organic matter contents.

- The leaves of the soybean defoliate close to the harvest stage and cover the soil which can constitute about 20-25 of the total biomass.

- Sowing finger millet on previous soybean plot improved grain yield by 1600-2200 kg ha^{-1} without applying fertilizers.

Farmers' Testimony

The elderly farmer, Adefris W/Michael living at Dano Roge kebele, Dano Woreda in western Ethiopia, was involved on the soybean demonstration trial in 2015 cropping season. He had the opportunity to evaluate different soybean varieties along with inoculants and P fertilizer with neighboring farmers, which was a new experience to him. He said, "I have never seen such type of crop holding crowded pods and all pods bear seeds, bottom to top". He was also surprised why such types of variability among the plots receiving the different inputs. During his evaluation along with male-grouped farmers, he had chosen the soybean planted with application of P fertilizer and together with "charcoal black type" of new fertilizer, the latter referring to the inoculant.

<<I saved my money that I would spend to buy urea to produce maize because planting of soybean in the previous year>>

He planted finger millet in 2016 cropping season on previously soybean planted plots, and he was amazed with the performance of the crop. "I saved my money that I would spend to buy urea to produce maize because planting of soybean in the previous year". He was to mean the litter-fall and the root and nodule turn-over of the soybean were easily decomposed and improve his land. Following this experience, he said, this year (2017), he is ready to use the demonstrated packages (Dhidhessa soybean variety with inoculant and NPS fertilizer) on half hectare of his land.

Farmers' Testimony

This maize plot (2016) was planted on previous (2015) soybean demonstration plots treated under P+I, I, P and control (no input). Farmer W/ro Askale Dugasa did not apply fertilizer to all of her plots since she was unable to buy the inorganic fertilizer. She was very surprised when she observed the performance of maize variety across the plots. She said that "I expect at least 20% yield advantage of maize from plot one (received P+I) as compared to other plots".

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N2Africa project is funded by Bill & Melinda Gates Foundation

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